

REMARKS

Claims 1-29 are pending in the application. These claims were rejected or objected to as follows:

Claims / Section	35 U.S.C. Sec.	References / Notes
4, 14, 25	§112, Second Paragraph Indefiniteness	<ul style="list-style-type: none">Ambiguity with respect to language related to modes.
1-3, 4-7, 9-11, 15-17, 20-24 & 26-29	§103(a) Obviousness	<ul style="list-style-type: none">Hagstrom, et al. (U.S. Patent No. 6,185,434).
4, 8, 25	§103(a) Obviousness	<ul style="list-style-type: none">Hagstrom, et al. (U.S. Patent No. 6,185,434); andMinarik (U.S. Patent No. 6,018,644).
12-14	§103(a) Obviousness	<ul style="list-style-type: none">Hagstrom, et al. (U.S. Patent No. 6,185,434); andBurgess (U.S. Patent No. 6,459,885).
18	§103(a) Obviousness	<ul style="list-style-type: none">Hagstrom, et al. (U.S. Patent No. 6,185,434); andWaldroup, et al. (U.S. Patent No. 6,070,058).
19	§103(a) Obviousness	<ul style="list-style-type: none">Hagstrom, et al. (U.S. Patent No. 6,185,434); andKurchuk, et al. (U.S. Patent No. 6,272,327).

5 Applicant has amended claims 1, 7, 8, and 28, cancelled claims 3, 4, and 25-27 and has added claims 30-35 for consideration by the Examiner. Applicant has also provided discussion for distinguishing the present invention, with claims as amended, from the art cited against it.

Applicant's use of reference characters below is for illustrative purposes only and is not intended to be limiting in nature unless explicitly indicated.

35 U.S.C. §112, SECOND PARAGRAPH INDEFINITENESS OF CLAIMS 4, 14 & 25

1. *Claims 4 and 25 have been cancelled. Paragraph [0038] of the originally
5 filed application discloses the possibility of a partial integration, which would permit
the use of a filter being realized as an independent component.*

In the OA, on pp. 2-3, under numbered paragraph 4, the Examiner rejected
claims 4, 14 and 25 as being indefinite. Applicant has cancelled claims 4 and 25,
thereby rendering the rejection for these claims moot. With regard to claim 14, the
10 Examiner stated that the applicant's specification teaches towards integrating the
components and removing "independent components" and further discloses that
independent components are only executed with their function.

Paragraph [0038] of the originally filed application states, in part:

15 The individual component parts of the circuit are only
executed with their function, so that a number of possible
variations exist for the realization of the inventive front-
end circuit. Thus, for example, it is possible to partly or
entirely integrate to components of the circuit on a
20 common substrate. For example, it is possible to
construct some of the filters as ceramic filters (for
example, MWK filters, SAW filters, as FBAR filters, as
stripline or as chip LC filters) and to embed these on a
substrate ceramic, for example, an LTCC multi-layer
ceramic (Low Temperature Co-fired Ceramic).
25 [Emphasis added]

Although the specification discusses how one would go about integrating the
components, one of ordinary skill in the art would clearly recognize that a partial
integration must inherently and by its very nature comprise a partial non-integration

as well. Therefore, the disclosure of partial integration inherently discloses the use of independent components as identified in claim 14. For these reasons, Applicant respectfully requests that the 35 U.S.C. §112 rejection be withdrawn from the application. Applicant welcomes any suggestions by the Examiner for claim
5 language that might better address the Examiner's concerns.

35 U.S.C. §103 (a), CLAIMS 1-3, 4-7, 9-11, 15-17, 20-24 & 26-29 OBVIOUSNESS OVER HAGSTROM

In the OA, on pp. 3-4, the Examiner stated that claim 1 of the present invention is obvious over Hagstrom. The Examiner stated:

10 As per claim 1, Hagstrom discloses a front end for a multi-mode cell phone comprising RF switch elements 14, 42, 43 (Fig. 5, Col 5 lines 44-67). The system further comprises [a] common antenna 21, mixed mode (GSM) filters 13a and 18a, and a DECT interface (pure mode
15 TDD), and filters 13b and 18b. The filters are coupled to the common antenna via the switches 14 and 43. Additionally, Hagstrom discloses that the bandpass filters used in Hagstrom may be switchable bandpass filters (Col 7 lines 25-36). Examiner also notes that Fig. 4 of
20 Hagstrom also reads on claim 1.

The Examiner indicated that Hagstrom does not specify that the interface comprises a pure FDD mode interface. The Examiner further stated:

25 Hagstrom additionally discloses that the system is not limited to specifically one GSM (mixed mode) and one DECT mode, but may be implemented with other known dual mode apparatuses (Col 7 lines 9-26). It would have been obvious to one of ordinary skill in the art at the time of this application to implement any combination of known band-pair systems (GSM, FDD/TDD, DECT, pure
30 FDD, or pure TDD), including the associated switching and filtering circuitry for the advantage of providing maximum compatibility with the system in which the phone is to be used.

Applicant has amended claim 1 to encompass a first transmission system that is an FDD/TDD mixed mode transmission system, a second transmission system that is a pure FDD mode transmission system, and a third transmission system that is a pure TDD mode transmission system, and further comprises signal paths and switches between the signal paths of the first and second transmission systems as well as between the transmit and receive paths of the third transmission system. Such a configuration is not obviated by the disclosure of Hagstrom. Similarly, claim 7 has been amended to include a first transmission that operates in a pure TDD mode, a second transmission system that operates in a pure FDD mode, and a combination of three filters with a duplexer and switch element that is not found in the disclosure of Hagstrom. The amendments to independent claims 1 and 7 therefore render the Examiner's arguments moot.

With regard to independent claim 24, the Examiner stated, on pp. 4-5:

As per claim 24, Hagstrom discloses a multi-mode interface as per the claim 1 rejection, however, Hagstrom does not disclose the system of Fig. 5 supporting multiple modes where the modes have overlapping/adjacent frequency ranges. Hagstrom discloses that his inventive system is a reduced sized, combined filter that is capable of implementing multiple modes wherein each mode is in a separate and spaced frequency range. Hagstrom additionally discloses that separate filters and switching elements may be implemented (as in prior art Fig. 4) to support multi-mode systems, and also that antenna switches may be used to support communication in the cases where the signaling used has overlapping frequency ranges (Col 2 lines 35-45). It would have been obvious to one of ordinary skill in the art at the time of this application that a design tradeoff could be made in designing the interface, either a system with lower part count (taking up less space) could be designed with the

limitation on the frequency ranges of the modes supported, or the system could have a greater amount of switches/filters and be able to support modes with overlapping frequency ranges (greater compatibility with various networks).

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Applicant respectfully disagrees that claim 24 is obvious in view of Hagstrom.

Given that the frequency bands of the mixed mode system and the pure mode system are overlapping or adjacent to each other, a front-end circuit comprising a triplexer to separate two transmission bands is obviously not suitable for separating two transmission bands whose operating frequencies are the same (see Hagstrom at 7/14-19). Therefore, the front-end circuit as claimed in claim 24 for separating two overlapping or adjacent frequency bands is not taught or suggested by Hagstrom. For these reasons, the Applicant asserts that the present invention, with claims as amended, is not obvious over Hagstrom.

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15 **35 U.S.C. §103 (a), CLAIMS 4, 8, AND 25 OBVIOUSNESS OVER HAGSTROM IN VIEW OF MINARIK**

In the OA, on p. 7, under numbered paragraph 7, the Examiner rejected claims 4, 8 and 25 as being obvious in view of the combination of Hagstrom and Minarik.

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The Examiner stated:

As per claims 25, 4, 8, Hagstrom discloses applicant's claims 1-3, 27 and discloses two RF switches 41 and 14a (Fig. 4) used to separate the band pairs (switch 41) and enable TDD switching (Switch 14a). Additionally, the system described in the claim 24 rejection discloses switches 41 and 14a (Fig. 4) used to separate the band pairs. However Hagstrom does not disclose the use of a multi-switch in place of switches 41 and 14a.

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Minarik discloses an RF multi-switch 26 (Fig. 1) used in a radio system front-end. It would have been obvious to one skilled in the art at the time of this application that switches 14a and 41 in Hagstrom could be implemented as a multi-switch for the purpose of lowering part count (manufacturing cost).

Applicant has cancelled claims 4 and 25. With respect to claim 8, claim 8 has been amended to depend from claim 7, which as been amended to more distinctly claim the invention. The Examiner relies on the addition of Minarik for disclosing the RF multi-switch, however, Applicant relies on the arguments made previously with respect to the patentability of claim 7 over Hagstrom, and asserts that the elements of amended claim 7 cannot be found in the combination of Hagstrom and Minarik.

In addition, the devices described in Minarik are multi-band devices comprising a plurality of transmission channels, wherein all channels are designed to operate at the same mode, namely, TDD mode (see Figs. 4-7), and therefore, Minarik's devices are not multi-mode.

A multi-switch in Fig. 1 of Minarik is designed to switch between common transmit-receive paths of different channels and not between transmission systems operating at different modes. Separate switches 130, 132, 134 are used to switch between TX/RX of the respective transmission channel.

For one skilled in the art, it is not obvious to use a single switch in order to switch between different transmission systems as well as between transmit and receive paths. The reason is that the performance of a conventional multiple-switch provided as a single chip is more nonlinear than that of a switch cascade comprising separate chips. Furthermore, a conventional multi-switch could fail to provide a

sufficient isolation between an antenna and a signal path (for instance, RX or TX).

The higher the number of paths to switch between, the more nonlinear the electrical characteristics of the switches are. The power level applied in the device of the art is on the order of 40 watts (see 2/43) and would be too high for available multi-

5 switches. For this reason, in order to separate TX and RX paths of a multi-band device, Minarik applies a combination of a power splitter 142 and separate switches 130, 132, 134 as a circuit connecting a common antenna to TX and RX of different channels (Fig. 5).

Therefore, Minarik provides no teaching or suggestion that this combination
10 could be replaced by a single multi-switch. A multi-switch designed to switch between different transmission systems, on the one hand, and a transmit path (TX) and a receive path (RX) of the same transmission system, on the other hand, is not obvious in view of this reference.

35 U.S.C. §103 (a), CLAIMS 12-14 OBVIOUSNESS OVER HAGSTROM IN VIEW OF BURGESS

15 In the OA, on pp. 7-8, under numbered paragraph 8, the Examiner rejected claims 12-14 as being obvious in view of the combination of Hagstrom and Burgess.

The Examiner stated:

20 As per claims 12,13, Hagstrom discloses applicant's claim 1 and the use of RF switches. However, Hagstrom does not specify what type(s) of switches are used. Burgess discloses a radio transceiver switching circuit comprising RF switches made from GaAs FET transistors or PIN diodes with additional phase shifters (capacitors)
25 (Col 1 lines 15-65). It would have been obvious to one skilled in the art at the time of this application that the switches could be made with GaAs FET transistors or

PIN diodes for the purpose that they are well known switch implementations that are effective in RF mobile phones.

As per claim 14, claim rejected for same reasons as claim 12, 13 rejections. Additionally, Hagstrom discloses that the triplex filter (which may comprise RF filters and duplexers) may be implemented as stripline filters (Col 6 lines 25-35). Additionally, Fig. 5 of Hagstrom (as per the claim 1 rejection) discloses further filters 13a, 13b, 18a, 18b and Fig. 4 of Hagstrom (as per claim 24 rejection) discloses filters 41 and 14a.

Claims 12-14 depend from claim 1, which has been substantially amended to more distinctly claim the invention, as described above. The Examiner relies on the addition of Burgess for disclosing a radio transceiver switching circuit comprising RF switches made from GaAs FET transistors or PIN diodes with additional phase shifters, however, Applicant relies on the arguments made previously with respect to the patentability of claim 1 over Hagstrom, and asserts that the elements of amended claim 1 cannot be found in the combination of Hagstrom and Burgess.

35 U.S.C. §103 (a), CLAIM 18 OBVIOUSNESS OVER HAGSTROM IN VIEW OF WALDROUP

In the OA, on pp. 8-9, under numbered paragraph 9, the Examiner rejected claim 18 as being obvious in view of the combination of Hagstrom and Waldroup.

The Examiner stated:

As per claim 18, Hagstrom discloses applicant's claim 1 and power amplifiers on the transmission path (Fig. 5). However, Hagstrom does not specify that the system comprises a directional coupler to regulate the power amplifier. Waldroup discloses a radio transceiver comprising a directional coupler 50 (Fig. 1). Used to regulate a power amplifier (ABSTRACT). He teaches that this allows for a more efficient use of battery power (Col 1 lines 29-50). It would have been obvious to one skilled in

the art at the time of this application to implement the additional power amp regulation for the purpose of conserving battery power.

Claim 18 depends from claim 1, which has been substantially amended to
5 more distinctly claim the invention, as described above. The Examiner relies on the addition of Waldroup for disclosing a radio transceiver comprising a directional coupler used to regulate a power amplifier for efficiency. Applicant relies on the arguments made previously with respect to the patentability of claim 1 over Hagstrom, and asserts that the elements of amended claim 1 cannot be found in the
10 combination of Hagstrom and Waldroup.

35 U.S.C. §103 (a), CLAIM 19 OBVIOUSNESS OVER HAGSTROM IN VIEW OF KURCHUK

In the OA, on p. 9, under numbered paragraph 10, the Examiner rejected claim 19 as being obvious in view of the combination of Hagstrom and Kurchuk.

The Examiner stated:

15 As per claim 19, Hagstrom discloses applicant's claim 1. However, Hagstrom does not specify that the system comprises a circulator arranged between the transmission amplifier and the antenna.

20 Kurchuk discloses a radio phone comprising circulator 350 (Fig. 6) (Col 9 lines 35-50). It would have been obvious to one skilled in the art at the time of this application to implement the circulator in Hagstrom's system for the purpose of protecting the transmitter from reflections.

25 Claim 19 depends from claim 1, which has been substantially amended to more distinctly claim the invention, as described above. The Examiner relies on the addition of Kurchuk for disclosing a radio phone comprising a circulator. Applicant

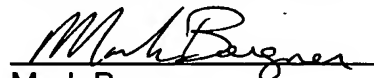
relies on the arguments made previously with respect to the patentability of claim 1 over Hagstrom, and asserts that the elements of amended claim 1 cannot be found in the combination of Hagstrom and Kurchuk.

For this above reasons, Applicant assert that the amended claim language
5 and arguments presented above clearly distinguishes over the prior art, and respectfully requests that the Examiner withdraw the 35 U.S.C. §103(a) rejection from the present application.

CONCLUSION

Inasmuch as each of the rejections have been overcome by the amendments
10 and arguments presented, and all of the examiner's suggestions and requirements have been satisfied, it is respectfully requested that the present application be reconsidered, the rejections be withdrawn and that this application be passed to issue.

Respectfully submitted,

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RCE, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450 on
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